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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Application of:

Confirmation No.: 7473

Alok Kumar SRIVASTAVA, et al.

Group Art Unit: 2195

Serial No.: 09/922,424

Examiner: Camquy TRUONG

Filed: August 3, 2001

Title: VICTIM SELECTION FOR DEADLOCK DETECTION

Mail Stop Appeal Brief – Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This Appeal Brief is submitted in support of the Notice of Appeal filed on November 7, 2005.

I. REAL PARTY IN INTEREST

Oracle International Corporation, of Redwood Shores, California, is the real party in interest.

II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of any related appeals or interferences.

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01 FC:1402

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02 FC:1251

120.00 OP

III. STATUS OF CLAIMS

Claims 1-5, 7-9, 13-23, 25-27, and 31-40 are pending in the present application, and Claims 6, 10-12, 24, and 28-30 were canceled during prosecution. Claims 1-5, 7-9, 13-23, 25-27, and 31-40 were rejected in the Final Office Action mailed on August 5, 2005 (hereinafter the "Final Office Action").

Subsequently, Claims 1-5 and 19-23 were allowed in the Advisory Action mailed on December 12, 2005 (hereinafter the "Advisory Action"). In the Advisory Action, Claims 13, 31, 38, and 40 were objected to as depending on a rejected base claim; apparently, however, Claims 13, 31, 38, and 40 include allowable subject matter and would be allowed if rewritten in independent form to include the subject matter of the claims upon which they currently depend.

Claims 7-9, 14-18, 25-27, 32-37, and 39 were finally rejected in the Final Office Action and in the Advisory Action, and are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendments were filed after the Final Office Action.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claims 7, 8, 25, and 26 are pending in the present application and are the subject of this appeal.

Claims 7, 8 and 25, 26 recite similar features, except in the context of a method and a computer-readable medium, respectively. Claims 7, 8, 25, and 26 are directed generally to an approach for selecting a victim to be used during the resolution of a deadlock.

One of the long-standing challenges in computing is dealing with deadlocks. A deadlock occurs if a set of entities exists such that each entity in the set is waiting for the release of at least one resource owned by another entity in the set. Entities capable of owning a resource are referred to herein as possessory entities. In the context of a database system, for example, entities may include among other things, processes and transactions. (Specification, page 1, lines 8-13). Computer systems employ a variety of deadlock handling mechanisms to detect deadlocks. The process of resolving a deadlock involves first determining if there is a deadlock and second determining how to resolve the deadlock. A couple of techniques for determining and resolving deadlocks include a wait-for graph technique and a time-out technique. (Specification, page 1, lines 20-24.)

The wait-for graph technique detects deadlocks based on “cycles”. After a process requests a resource, or waits more than a threshold period of time for a resource, a wait-for graph may be generated and examined for any cycles. If any cycles are identified, then the deadlock detection mechanism has identified a deadlock. A resource that is a part of the deadlock cycle is then selected for use in resolving the deadlock. The resource thus selected is referred to herein as the “victim resource” because the entity that possesses or is requesting the resource will typically incur a performance penalty when steps are taken to resolve the deadlock. Similarly, the entity that possesses or is requesting the victim resource is referred to herein as the “victim entity”. The term “victim” is used herein to refer to either the victim resource or the victim entity. (Specification, page 1, line 25 to page 2, line 8.) One way to break the detected cycle and to resolve the deadlock is to cause the lock on the victim resource to be released. (Specification, page 2, lines 10-12.) The resource, which is involved in the deadlock and which is held by a possessory entity that most recently requested a

resource, may be selected as the victim resource. (Specification, page 4, lines 5-9, referring to Entity 110 and resource R1 in FIG. 1a.)

Under the time-out technique, a possessory entity is presumed to be involved in a deadlock once the possessory entity waits a threshold period of time to obtain ownership of a resource. The time-out technique is less accurate in detecting deadlocks, since delays in obtaining ownership of a resource may result from many causes other than deadlock. (Specification, page 4, lines 10-13.)

Unfortunately, selecting the victim resource to be either (1) the most recently requested resource involved in a deadlock cycle, or (2) the resource requested by an entity that “times out”, may result in significant overhead. For example, in either case, the victim entity could be a long-running transaction that is nearly complete. Where a victim entity is a transaction, it may be necessary to re-execute the entire transaction. Terminating such an entity is particularly wasteful when the deadlock could be broken in some other manner using minimal overhead. (Specification, page 4, lines 14-20.)

The invention recited in Claims 7, 8, 25, and 26 addresses the problem of how to select a victim for the resolution of a deadlock, such that the deadlock would be resolved in an efficient manner using minimal overhead. This problem is addressed by an approach in which initially a plurality of candidates involved in a deadlock is established as candidates to be a victim. The plurality of candidates is then filtered based on one or more factors until a single candidate remains as a candidate to be the victim, wherein for each candidate at least one factor is taken into account. The single remaining candidate is selected as the victim. Once the victim has been selected, various techniques may be used to resolve the deadlock. (Specification, page 5, lines 5-12; page 7, line 19 to page 8, line 9.)

In the invention recited in Claims 7 and 25, the step of filtering the plurality of candidates includes removing from the plurality of candidates any candidates that have a CAN-BE-VICTIM flag that indicates the candidate cannot be a victim. A CAN-BE-VICTIM flag associated with a candidate is set to “true” or “false” and indicates whether the candidate is allowed to be selected as a victim. (Specification, page 7, lines 23-25; page 8, lines 12-21.)

In the invention recited in Claims 8 and 26, the step of filtering the plurality of candidates includes removing from the plurality of candidates any candidates whose resource priority is higher than the resource priority of at least one of the other candidates. The priority assigned to a resource may be a static numeric value, which is assigned at the start of the application, or it may be a dynamic numeric value that changes during the life of a resource depending upon the resource usage and the status of the possessory entity that is holding the resource. In some embodiments, a static priority may be established by assigning a numeric value to a resource based on the functional significance of the resource to the application. In some embodiments, a dynamic priority may be established by computing the amount of contention for that resource. In some embodiments, a dynamic priority value of a resource may be added to a static priority value for the resource to create a composite priority for the resource. (Specification, page 7, line 26; page 8, line 25 to page 9, line 7.)

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Claims 7-9, 14, 17-18, 25-27, 32, 35-37, and 39 have been rejected as allegedly unpatentable under 35 U.S.C. § 103(a) over Iba et al., U.S. Patent No. 5,835,766 (“IBA”) in view of Davies et al., U.S. Patent No. 5,682,537 (“DAVIES”).

B. Claims 15-16 and 33-34 have been rejected as allegedly unpatentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES, and further in view of Porter et al., U.S. Patent No. 6,332,023 ("PORTER").

VII. ARGUMENTS

A. Introduction

It is well founded that to establish a *prima facie* case of obviousness under 35 U.S.C. § 103(a), all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). If an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988).

With respect to the present application, it is respectfully submitted that Claims 7-9, 14, 17-18, 25-27, 32, 35-37, and 39 include one or more limitations that are not taught or suggested by IBA and DAVIES. Further, it is also submitted that Claims 15-16 and 33-34 include one or more limitations that are not taught or suggested by IBA, DAVIES, and PORTER.

B. Claim 7 is patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES because it includes one or more features that are not taught or suggested by IBA and DAVIES

Independent Claim 7 has been rejected as allegedly unpatentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES.

Claim 7 includes the feature of:

wherein the step of filtering further includes removing from said plurality of candidates any candidates that have a **CAN-BE-VICTIM flag** that indicates the candidate cannot be a victim.

Thus, in Claim 7 one of the factors taken into account in whether to consider selecting a candidate as a victim for resolving a deadlock is a CAN-BE-VICTIM flag that indicates whether or not the candidate can be considered in the selection of a deadlock victim. This feature of Claim 7 is not shown or in any way suggested by IBA or DAVIES. Moreover, nothing in IBA or DAVIES teaches, describes, or suggests anything that is equivalent to the CAN-BE-VICTIM flag featured in Claim 7.

It is significant that the step:

wherein the step of filtering further includes removing from said plurality of candidates any candidates that have a **CAN-BE-VICTIM flag** that indicates the candidate cannot be a victim.

necessarily takes place after the step:

initially establishing a plurality of resources involved in said deadlock as a set of candidates to be said victim;

The order of these steps is a logical necessity, since it would be impossible to remove a member (e.g. candidate) from a set (e.g. the initially established “plurality of candidates”) before the set is even formed. The fact that these are separate and distinct steps, and that they necessarily take place in a certain order, is critical in appreciating why the claims are allowable over all of the cited art.

1. The TimeStamps described in DAVIES are not equivalent to the CAN-BE-VICTIM flag featured in Claim 7.

The Final Office Action asserts that the use of TimeStamps as described in col. 12, lines 31-51 of DAVIES is equivalent to the feature of Claim 7 of:

wherein the step of filtering further includes removing from said plurality of candidates any candidates that have a **CAN-BE-VICTIM** flag that indicates the candidate cannot be a victim.

This is incorrect. DAVIES does not use TimeStamps to “filter” or “remove” candidates from an already established set of “victim candidates”. Rather, **at the time that DAVIES looks at the timestamps, the DAVIES system has not yet even determined whether there is a deadlock, much less established a set of victim candidates for breaking a deadlock.**

Specifically, in col. 12, lines 31-51 DAVIES states:

The Queued-Requests List 126 is searched at Step 204. **Only those Lock Requests 128a-c that have been queued for a predetermined period of time are reported to the Deadlock Detector 92**, rather than reporting all Lock Requests on the Queued-Requests List. Because the Queued Requests List is ordered according to the Time Stamps of the Lock Requests 128a-c, processing of the Queued Requests List begins at the head of the list and proceeds until a Lock Request is encountered whose Time Stamp indicates that its time in the list is less than the Request Time-out period. Referencing FIG. 6, Lock Request 128a is the first Lock Request that is checked. If its Time Stamp indicates that it has been queued longer than the Request Time-out Period, an entry is placed in the Queued Requests Packet, as indicated by Step 206, that will be sent to the Deadlock Detector.

Once all the timed-out Lock Requests are identified and entries placed in a Queued-Requests Packet, the Packet is sent from a Deadlock Preprocessor element 74a-d to the Deadlock Detector 92 using common message passing techniques. (Emphasis added.)

The Queued-Requests List described in the above passage is not a list of candidates for a deadlock victim, but “is used for managing requests for locking records for which there is presently a conflicting lock held by another [sic] transaction.” (DAVIES, col. 10, lines 36-38). Moreover, the above passage makes it clear that the TimeStamp of each lock request placed on the Queued-Requests List is used to determine whether that lock request “has been queued longer than the Request Time-out Period” (DAVIES, col. 12, lines 42-43); if a particular lock request has been on the Queued-Requests List longer than the Request time-

out period, then that particular lock request is placed in a Queued-Requests Packet which is sent to a Deadlock Detector **that determines whether that lock request is involved in a deadlock.** (DAVIES, col. 12, lines 44-51.) Therefore, within the DAVIES system, the TimeStamps are used to determine whether there is a deadlock. Determining whether there is a deadlock necessarily comes before establishing an initial set of candidate victims. Establishing an initial set of candidate victims necessarily comes before removing candidates from the candidate pool.

Thus, at most DAVIES may be describing that the TimeStamp of a lock request may be used to make a determination of whether the transaction that issued the lock request is **potentially** involved in a deadlock. However, neither the above passage nor anything else in DAVIES teaches, describes, or suggests that a TimeStamp may be used to eliminate a transaction, which is involved in a deadlock, from being considered as a potential victim for resolving a deadlock. In contrast, Claim 7 includes the feature of filtering a plurality of victim candidates by removing from the plurality of candidates any candidates that have a CAN-BE-VICTIM flag that indicates the candidate cannot be a victim.

For the above reason, it is respectfully submitted that the TimeStamps described in DAVIES are not equivalent to the CAN-BE-VICTIM flag featured in Claim 7.

The other passage from DAVIES cited in the Final Office Action as allegedly showing the above feature of Claim 7 similarly fails to disclose the feature. In col. 15, lines 56-58, DAVIES describes that an object lock request from a processing activity such as a queued lock-requester may be enqueued. However, nothing in this passage teaches, describes, or suggests that a queued lock-requester may be eliminated from being considered

as a deadlock victim based on something equivalent to a CAN-BE-VICTIM flag as featured in Claim 7.

Furthermore, as the passage in col. 12, lines 31-51 of DAVIES suggests, the lock requests on the Queued-Requests List are reported to the Deadlock Detector. “[T]he Deadlock Detector waits for a predetermined period of time, which is specified by the Lock Reporting Period, to perform a periodic check for deadlock.” (DAVIES, col. 13, lines 59-61.) It therefore follows that the lock requests on the Queued-Requests List necessarily are entered in the list BEFORE a deadlock is detected by the Deadlock Detector. For this reason, the Queued-Requests List is not even equivalent to a list of plurality of candidates involved in a deadlock, as featured in Claim 7.

2. The Check_Holder function described in DAVIES is not equivalent to the CAN-BE-VICTIM flag featured in Claim 7.

The Advisory Action asserts that the Check_Holder function as described in col. 14, lines 31-32 of DAVIES is equivalent to the CAN-BE-VICTIM flag of Claim 7. This is not correct.

Specifically, in col. 14, lines 25-32, DAVIES states:

Deadlock_check processing initiates check_holder processing to determine whether the Requester Transaction D is part of a deadlock cycle. The check_holder processing is a recursive function that takes as inputs an index into the Lock Conflict List 308 and the Owner Transaction D that corresponds to the Requester Transaction ID in process. **Check_holder returns a 1 if a deadlock cycle is detected and a 0 if no cycle was detected.** (Emphasis added.)

The above passage clearly and unambiguously states that the Check_Holder is a recursive function that is used to determine whether a particular transaction (identified as an input parameter to the function) is participating in a deadlock cycle. The Check_Holder function

returns “1” if a deadlock cycle is detected and “0” if a deadlock cycle is not detected. Thus, the Check_Holder function is nothing more than a function that detects whether a particular transaction participates in a deadlock cycle. However, a function that determines whether a particular transaction participates in a deadlock cycle is not equivalent to a CAN-BE-VICTIM flag that indicates that a candidate involved in a deadlock cannot be selected as a victim, as featured in Claim 7.

Furthermore, DAVIES does NOT teach or suggest that the results returned by the Check_Holder function are used to **resolve** a detected deadlock. Once the Deadlock Detector of DAVIES identifies a deadlock, the Deadlock Detector resolves the deadlock by releasing ALL transactions involved in the deadlock (see DAVIES col. 15, lines 19-22) and does NOT take into account the value returned by the Check_Holder function that may be associated with a particular transaction. Thus, DAVIES does NOT perform **any** “filtering” or “removing” of the transactions involved in the deadlock based on values returned by the Check_Holder function. In contrast, Claim 7 recites the feature of wherein the step of filtering includes removing from the plurality of candidates involved in a deadlock any candidates that have a CAN-BE-VICTIM flag that indicates the candidate cannot be a victim.

For the reasons given above, IBA and DAVIES, whether taken alone or in combination, do not teach or suggest all of the features recited in Claim 7. Thus, it is respectfully submitted that Claim 7 is patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES.

C. Independent Claim 25

Independent Claim 25 includes features similar to the features of Claim 7, except in the context of a computer-readable medium. It is therefore respectfully submitted that Claim

25 is patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES for at least the reasons set forth herein with respect to Claim 7.

D. Claim 8 is patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES because it includes one or more features that are not taught or suggested by IBA and DAVIES

Independent Claim 8 has been rejected as allegedly unpatentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES. Specifically, the Advisory Action asserts that Claim 8 does not describe “resource priority of a resource”. This assertion is incorrect.

Claim 8 includes the feature of:

wherein the step of filtering further includes removing from said plurality of candidates the candidates whose **resource priority** is higher than the resource priority of at least one of the other candidates.

Thus, in Claim 8 one of the factors taken into account in whether to consider selecting a candidate as a victim for resolving a deadlock is the resource priority of a resource held by a candidate. Specifically, Claim 8 includes the feature of removing from a plurality of candidates the candidates whose resource priority is higher than the resource priority of at least one of the other candidates. It is respectfully submitted that this feature of Claim 8 is not shown or in any way suggested by IBA or DAVIES.

It appears that this rejection is similar to the CANNOT-BE-VICTIM rejection in that both rejections resulted from blurring a very important distinction. In this case, the significant distinction to keep in mind is the difference between resources and possessory entities.

In particular, nothing in IBA or DAVIES shows or suggests that **resources** have priorities, much less that the **priority of a resource** involved in a deadlock is in any way

relevant to eliminating a candidate from being considered for a deadlock victim. The priorities discussed in IBA are priorities of transactions and not the priorities of the resources that may be accessed by these transactions. (See, for example, IBA, col. 12, lines 46-52.)

It is respectfully submitted that there is a fundamental difference between transactions that access resources and resources that are being accessed by the transactions. Specifically, the present specification refers to possessory entities, such as for example processes or transactions, which are capable of acquiring or owning a resource (see Application, page 1, lines 10-13; Fig. 1b), and the resources are the things which the possessory entities can acquire or get hold of (see Application, page 7, lines 13-17; Fig. 1b). Thus, it is clear that the resource priority referred to in Claim 8 is a priority associated with a resource that is being accessed by a possessory entity such as a transaction.

In contrast, the passage from IBA (col. 12, lines 46-52) cited by the Office Action clearly indicates that the priority based on which a transaction is selected as a deadlock victim is a priority **associated with a transaction**, which in the context of Claim 8 would be considered a possessory entity and not a resource.

As a practical matter, the operation of a system which takes into account the **priority of a resource** held by a possessory entity to determine the selection of a deadlock victim is different than the operation of a system which takes into account a priority associated with the possessory entity itself. For example, suppose that a certain resource involved in a deadlock has a very low priority. Further suppose that the resource is held by a transaction with a very high priority. If the priority of the transaction is used to determine the victim for resolving the deadlock (as is done in the IBA system), then the transaction is not going to be selected as the deadlock victim. However, if the selection of the deadlock victim is based on

the priority of the resource (such as featured in Claim 8), then the transaction will be selected as the deadlock victim even though the transaction has a very high priority, because the resource held by the transaction is of low priority and thus deemed not important or significant.

It is important to note that the Appellants are not saying that it is always erroneous to call transactions “resources”. In fact, there may be a context in which it is proper to refer to a “transaction” as a resource. However, in the context of the present claims, saying that “transactions” can be the claimed “resources” is erroneous and nonsensical. For example, there are no “possessory entities” that attempt to obtain locks on transactions. When a deadlock occurs, it is not because something is trying to access transactions, it is because transactions are trying to access resources.

For the reasons given above, IBA and DAVIES, whether taken alone or in combination, do not teach or suggest all of the features recited in Claim 8. Thus, it is respectfully submitted that Claim 8 is patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES.

E. Independent Claim 26

Independent Claim 26 includes features similar to the features of Claim 8, except in the context of a computer-readable medium. It is therefore respectfully submitted that Claim 26 is patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES for at least the reasons set forth herein with respect to Claim 8.

F. Dependent Claims 15-16 and 33-34 are patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES and further in view of PORTER

**because they include one or more features that are not taught or
suggested by IBA, DAVIES, and Porter**

Dependent Claims 15-16 and 33-34 have been rejected as allegedly unpatentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES and further in view of PORTER.

Claims 15-16 and 33-34 are dependent upon independent Claims 7 and 25, respectively, and thus include each and every feature of their corresponding independent claim. Furthermore, in rejecting Claims 15-16 and 33-34 the Final Office Action relies explicitly on PORTER, and not on IBA or DAVIES, to show the features discussed above with respect to Claims 7 and 25. Because PORTER does not teach the subject matter of Claims 7 and 25, any combination of PORTER with the other two references necessarily fails to teach the complete combination recited in any dependent claim of Claims 7 or 25. Thus, each of Claims 15-16 and 33-34 is allowable for at least the reasons given above for Claims 7 and 25. In addition, each of Claims 15-16 and 33-34 introduces one or more additional features that independently render it patentable over IBA in view of DAVIES and further in view of PORTER.

In view of the foregoing, it is respectfully submitted that Claims 15-16 and 33-34 are patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES and further in view of PORTER since each of these claims includes one or more features that are not in any way taught or suggested by IBA, DAVIES, and PORTER.

**G. Objected to Claims 13, 31, 38, and 40 are patentable under 35 U.S.C. §
103(a) over IBA in view of DAVIES because they include one or more
features that are not taught or suggested by IBA and DAVIES**

Dependent Claims 13, 31, 38, and 40 have been objected to as depending on a rejected base claim, but would be allowable if rewritten in independent form to include the subject matter of their corresponding base claim.

Claims 13, 31, 38, and 40 are dependent upon independent Claims 7, 25, 8, and 26, respectively, and thus include each and every feature of their corresponding independent claim. Thus, Claims 13, 31, 38, and 40 are patentable for at least the reasons given above with respect to independent Claims 7, 25, 8, and 26. In addition, the Advisory Action apparently indicates that Claims 13, 31, 38, and 40 include one or more features that independently render these claims patentable over the prior art of record.

In view of the foregoing, it is respectfully submitted that dependent Claims 13, 31, 38, and 40 are patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES since each of these claims includes one or more features that are not in any way taught or suggested by IBA and DAVIES.

H. Dependent Claims 9, 14, 17-18, 27, 32, 35-37, and 39

Dependent Claims 9, 14, 17-18, 27, 32, 35-37, and 39 have been rejected as allegedly unpatentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES.

Claims 9, 14, 17-18, 27, 32, 35-37, and 39 are dependent upon one of independent Claims 7, 8, 25, and 26, respectively, and thus include each and every feature of their corresponding independent claim. Thus, Claims 9, 14, 17-18, 27, 32, 35-37, and 39 are patentable under 35 U.S.C. § 103(a) over IBA in view of DAVIES for at least the reasons given above with respect to independent Claims 7, 8, 25, and 26.

VIII. CONCLUSION AND PRAYER FOR RELIEF

Based on the foregoing, it is respectfully submitted that the rejections of Claims 7-9, 14-18, 25-27, 32-37, and 39 under 35 U.S.C. § 103(a) as being unpatentable over the art of record lack the requisite factual and legal bases.

The Appellants therefore respectfully request that the Honorable Board reverse the rejections of Claims 7-9, 14, 17-18, 25-27, 32, 35-37, and 39 under 35 U.S.C. § 103(a) over IBA in view of DAVIES. Further, the Appellants respectfully request that the Honorable Board reverse the rejections of Claims 15-16 and 33-34 under 35 U.S.C. § 103(a) over IBA in view of DAVIES and further in view of PORTER.

Respectfully submitted,

HICKMAN PALERMO TRUONG & BECKER LLP

Date: January 5, 2006



Stoycho D. Draganoff
Reg. No. 56,181

2055 Gateway Place, Suite 550
San Jose, California 95110-1089
Tel: (408) 414-1080 ext. 208
Fax: (408) 414-1076

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on January 5, 2006

by


Teresa Austin

CLAIMS APPENDIX

- 1 1. A method for selecting a victim to be used during resolution of a deadlock, the
2 method comprising the steps of:
3 initially establishing a plurality of resources involved in said deadlock as a set of
4 candidates to be said victim;
5 performing a first filtering pass that removes candidates from said set based on
6 CAN-BE-VICTIM flags associated with said candidates;
7 if more than a single candidate remains in said set after said first filtering pass,
8 then performing a second filtering pass that removes candidates from said
9 set based on priorities associated with said candidates; and
10 if more than a single candidate remains in said set after said second filtering pass,
11 then performing a third filtering pass that removes candidates from said set
12 based on runtimes associated with possessory entities associated with said
13 candidates; and
14 when said set has been filtered to include a single candidate, selecting said
15 candidate as said victim.
- 1 2. The method of Claim 1 wherein at least a portion of the priority of a given
2 resource is established dynamically.
- 1 3. The method of Claim 2 wherein said portion is established based on which other
2 resources are held by a possessory entity associated with the given resource.

1 4. The method of Claim 1 wherein at least a portion of the priority of a given
2 resource is established statically.

1 5. The method of Claim 4 wherein said portion is established based on the type of
2 the given resource.

1 6. (Canceled)

1 7. A method for selecting a victim to be used during resolution of a deadlock, the
2 method comprising the steps of:
3 initially establishing a plurality of candidates involved in said deadlock as
4 candidates to be said victim;
5 filtering said plurality of candidates based on one or more factors until a single
6 candidate remains as a candidate to be said victim, wherein the step of
7 filtering comprises filtering each candidate of the plurality of candidates
8 by taking into account, for each candidate, at least one factor of the one or
9 more factors;
10 selecting said single candidate as the victim to be used during resolution of said
11 deadlock; and
12 wherein the step of filtering further includes removing from said plurality of
13 candidates any candidates that have a CAN-BE-VICTIM flag that
14 indicates the candidate cannot be a victim.

1 8. A method for selecting a victim to be used during resolution of a deadlock, the
2 method comprising the steps of:
3 initially establishing a plurality of candidates involved in said deadlock as
4 candidates to be said victim;
5 filtering said plurality of candidates based on one or more factors until a single
6 candidate remains as a candidate to be said victim, wherein the step of
7 filtering comprises filtering each candidate of the plurality of candidates
8 by taking into account, for each candidate, at least one factor of the one or
9 more factors;
10 selecting said single candidate as the victim to be used during resolution of said
11 deadlock; and
12 wherein the step of filtering further includes removing from said plurality of
13 candidates the candidates whose resource priority is higher than the
14 resource priority of at least one of the other candidates.

1 9. The method of Claim 7 wherein the step of filtering further includes removing
2 from said plurality of candidates all the candidates that are associated with
3 possessory entities have been running for a duration of time that is relatively
4 longer than the duration of time that possessory entities associated with the other
5 candidates have been running.

1 10. (Canceled)

1 11. (Canceled)

1 12. (Canceled)

1 13. The method of Claim 7 wherein the step for filtering further comprises the
2 computer-implemented steps of:
3 performing a first pass to filter out any candidates that have a CAN-BE-VICTIM
4 flag indicating that one is not candidate for termination;
5 if more than one candidate is left after performing the first pass, then performing a
6 second pass to filter out any candidates whose resource priority is higher
7 than the resource priority of at least one of the other candidates;
8 if more than one candidate is left after performing the second pass, then
9 performing a third pass to filter out all the candidates except the candidate
10 that has been running for the shortest duration of time.

1 14. The method of Claim 7 wherein the step of filtering includes filtering based on
2 priorities established for said candidates.

1 15. The method of Claim 14 wherein at least a portion of the priority of a given
2 candidate is established dynamically.

1 16. The method of Claim 15 wherein said portion is established based on which
2 resources other than said candidate are held by a possessory entity associated with
3 the given candidate.

1 17. The method of Claim 14 wherein at least a portion of the priority of a given
2 candidate is established statically.

1 18. The method of Claim 17 wherein said portion is established based on the type of
2 the given candidate.

1 19. A computer-readable medium carrying instructions for selecting a victim to be
2 used during resolution of a deadlock, the computer-readable medium comprising
3 instructions for performing the steps of:
4 initially establishing a plurality of resources involved in said deadlock as a set of
5 candidates to be said victim;
6 performing a first filtering pass that removes candidates from said set based on
7 CAN-BE-VICTIM flags associated with said candidates;
8 if more than a single candidate remains in said set after said first filtering pass,
9 then performing a second filtering pass that removes candidates from said
10 set based on priorities associated with said candidates; and
11 if more than a single candidate remains in said set after said second filtering pass,
12 then performing a third filtering pass that removes candidates from said set

13 based on runtimes associated with possessory entities associated with said
14 candidates; and
15 when said set has been filtered to include a single candidate, selecting said
16 candidate as said victim.

1 20. The computer-readable medium of Claim 19 wherein at least a portion of the
2 priority of a given resource is established dynamically.

1 21. The computer-readable medium of Claim 20 wherein said portion is established
2 based on which other resources are held by a possessory entity associated with the
3 given resource.

1 22. The computer-readable medium of Claim 19 wherein at least a portion of the
2 priority of a given resource is established statically.

1 23. The computer-readable medium of Claim 22 wherein said portion is established
2 based on the type of the given resource.

1 24. (Canceled)

1 25. A computer-readable medium carrying instructions for selecting a victim to be
2 used during resolution of a deadlock, the computer-readable medium carrying
3 instructions for performing the steps of:

4 initially establishing a plurality of candidates involved in said deadlock as
5 candidates to be said victim;
6 filtering said plurality of candidates based on one or more factors until a single
7 candidate remains as a candidate to be said victim, wherein the step of
8 filtering comprises filtering each candidate of the plurality of candidates
9 by taking into account, for each candidate, at least one factor of the one or
10 more factors;
11 selecting said single candidate as the victim to be used during resolution of said
12 deadlock; and
13 wherein the step of filtering further includes removing from said plurality of
14 candidates any candidates that have a CAN-BE-VICTIM flag that
15 indicates the candidate cannot be a victim.

1 26. A computer-readable medium carrying instructions for selecting a victim to be
2 used during resolution of a deadlock, the computer-readable medium carrying
3 instructions for performing the steps of:
4 initially establishing a plurality of candidates involved in said deadlock as
5 candidates to be said victim;
6 filtering said plurality of candidates based on one or more factors until a single
7 candidate remains as a candidate to be said victim, wherein the step of
8 filtering comprises filtering each candidate of the plurality of candidates
9 by taking into account, for each candidate, at least one factor of the one or
10 more factors;

11 selecting said single candidate as the victim to be used during resolution of said
12 deadlock; and
13 wherein the step of filtering further includes removing from said plurality of
14 candidates the candidates whose resource priority is higher than the
15 resource priority of at least one of the other candidates.

1 27. The computer-readable medium of Claim 25 wherein the step of filtering further
2 includes removing from said plurality of candidates all the candidates that are
3 associated with possessory entities have been running for a duration of time that is
4 relatively longer than the duration of time that possessory entities associated with
5 the other candidates have been running.

1 28. (Canceled)

1 29. (Canceled)

1 30. (Canceled)

1 31. The computer-readable medium of Claim 25 wherein the step for filtering further
2 comprises the computer-implemented steps of:
3 performing a first pass to filter out any candidates that have a CAN-BE-VICTIM
4 flag indicating that one is not candidate for termination;

5 if more than one candidate is left after performing the first pass, then performing a
6 second pass to filter out any candidates whose resource priority is higher
7 than the resource priority of at least one of the other candidates;
8 if more than one candidate is left after performing the second pass, then
9 performing a third pass to filter out all the candidates except the candidate
10 that has been running for the shortest duration of time.

1 32. The computer-readable medium of Claim 25 wherein the step of filtering includes
2 filtering based on priorities established for said candidates.

1 33. The computer-readable medium of Claim 32 wherein at least a portion of the
2 priority of a given candidate is established dynamically.

1 34. The computer-readable medium of Claim 33 wherein said portion is established
2 based on which resources other than said candidate are held by a possessory entity
3 associated with the given candidate.

1 35. The computer-readable medium of Claim 32 wherein at least a portion of the
2 priority of a given candidate is established statically.

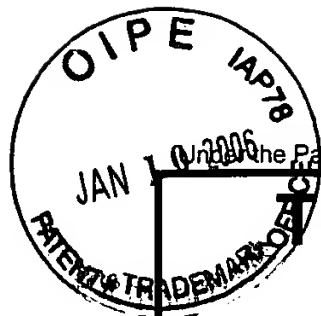
1 36. The computer-readable medium of Claim 35 wherein said portion is established
2 based on the type of the given candidate.

1 37. The method of Claim 8 wherein the step of filtering further includes removing
2 from said plurality of candidates all the candidates that are associated with
3 possessory entities have been running for a duration of time that is relatively
4 longer than the duration of time that possessory entities associated with the other
5 candidates have been running

1 38. The method of Claim 8 wherein the step for filtering further comprises the
2 computer-implemented steps of:
3 performing a first pass to filter out any candidates that have a CAN-BE-VICTIM
4 flag indicating that one is not candidate for termination;
5 if more than one candidate is left after performing the first pass, then performing a
6 second pass to filter out any candidates whose resource priority is higher
7 than the resource priority of at least one of the other candidates;
8 if more than one candidate is left after performing the second pass, then
9 performing a third pass to filter out all the candidates except the candidate
10 that has been running for the shortest duration of time.

1 39. The computer-readable medium of Claim 26 wherein the step of filtering further
2 includes removing from said plurality of candidates all the candidates that are
3 associated with possessory entities have been running for a duration of time that is
4 relatively longer than the duration of time that possessory entities associated with
5 the other candidates have been running.

1 40. The computer-readable medium of Claim 26 wherein the step for filtering further
2 comprises the computer-implemented steps of:
3 performing a first pass to filter out any candidates that have a CAN-BE-VICTIM
4 flag indicating that one is not candidate for termination;
5 if more than one candidate is left after performing the first pass, then performing a
6 second pass to filter out any candidates whose resource priority is higher
7 than the resource priority of at least one of the other candidates;
8 if more than one candidate is left after performing the second pass, then
9 performing a third pass to filter out all the candidates except the candidate
10 that has been running for the shortest duration of time.



TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

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ENCLOSURES (check all that apply)

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SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Hickman Palermo Truong & Becker LLP Stoycho D. Draganoff
Signature	<i>Stoycho Draganoff</i>
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